

Protura from Khabarovsk, the Russian Far East

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Abstract Through the Japanese-Russian cooperative scientific study in 2000, 57 proturan specimens were obtained from Khabarovsk, the Russian Far East. The collection comprised 9 species in 6 genera, including 4 new species. The remaining 4 species except an undetermined one are new to Russia: *Baculentulus loxoglenus* Yin, *Yamatentomon kunnepchupi* Imadaté, *Verrucoentomon kawakatsui* (Imadaté) and *Eosentomon asahi* Imadaté.

Key words: Acerentomidae, Eosentomidae, new record, new species, taxonomy

Introduction

Since the first species of Protura was described by Silvestri (1907), about 700 species have so far been recorded from all over the world. In particular, a lot of studies have been performed in Europe, China and Japan and the faunas of the areas are better known than those of other ones.

In 2000, the Japanese-Russian cooperative scientific study was carried out in Khabarovsk, the Russian Far East, then 57 proturan specimens having been collected. The knowledge of fauna in Middle and North Asia (= former Soviet Union) is scarce and only 13 species are recorded (Szeptycki, 2002). As for the Russian Far East, only one species, *Acerella sharovi* Martynova, 1977 (= *Imadateiella sharovi* (see Imadaté, 1981)), was recorded from Magadan (Martynova, 1977). The present materials, therefore, should be worth recording, because these are thought to shed fresh light on our demand for clarifying the proturan fauna of East and North Asia.

Close examination revealed that the specimens mentioned above were composed of 9 species, of which 4 were new to science and other 4 new to Russia except an undetermined one form. The new species and the species new to the country are described and redescribed here.

Materials and Methods

The materials were collected at the following two localities in the Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 600 m in altitude on September 9, 2000.

Loc. 1 (135°12'N, 48°15'E): A mixed forest of *Abies nephrolepis* (Trautv.) Maxim., *Acer ukurunduense* Trautv. & Mey. and *Acer mono* Maxim., with ground cover mainly of *Carex campylorhina* V. Krecz. and *Symplocos chinensis* (Lour.) Druce.

Loc. 2 (135°10'N, 48°10'E): Another mixed forest of *Abies nephrolepis*, *Acer ukurunduense*, *Sorbaria sorbifolia* (L.) A. Braun and *Actinidia kolomikta* (Rupr. et Maxim.) Maxim., with *Calamagrostis langsdorffii* (Link) Trin. as a main ground cover.

All the proturans extracted were individually mounted in polyvinyl-lactophenol medium. The slides were dried for three days in an oven at 60°C.

In the following descriptions, the range of measurement is shown as in the form of (minimum paratype-) holotype (-maximum paratype), sometimes values of holotype being smallest or largest. In the case of a single paratype, its measurement is put in parentheses.

For the abbreviations used in the text and figures, see the Appendix.

The specimens examined, including the holotype and paratypes are deposited in the Zoological Museum of St. Petersburg, Russia.

Descriptions and Redescriptions

Family Acerentomidae Silvestri, 1907

Baculentulus borealis sp. nov.

(Figs. 1–15)

Body length: 955 (1014) µm.

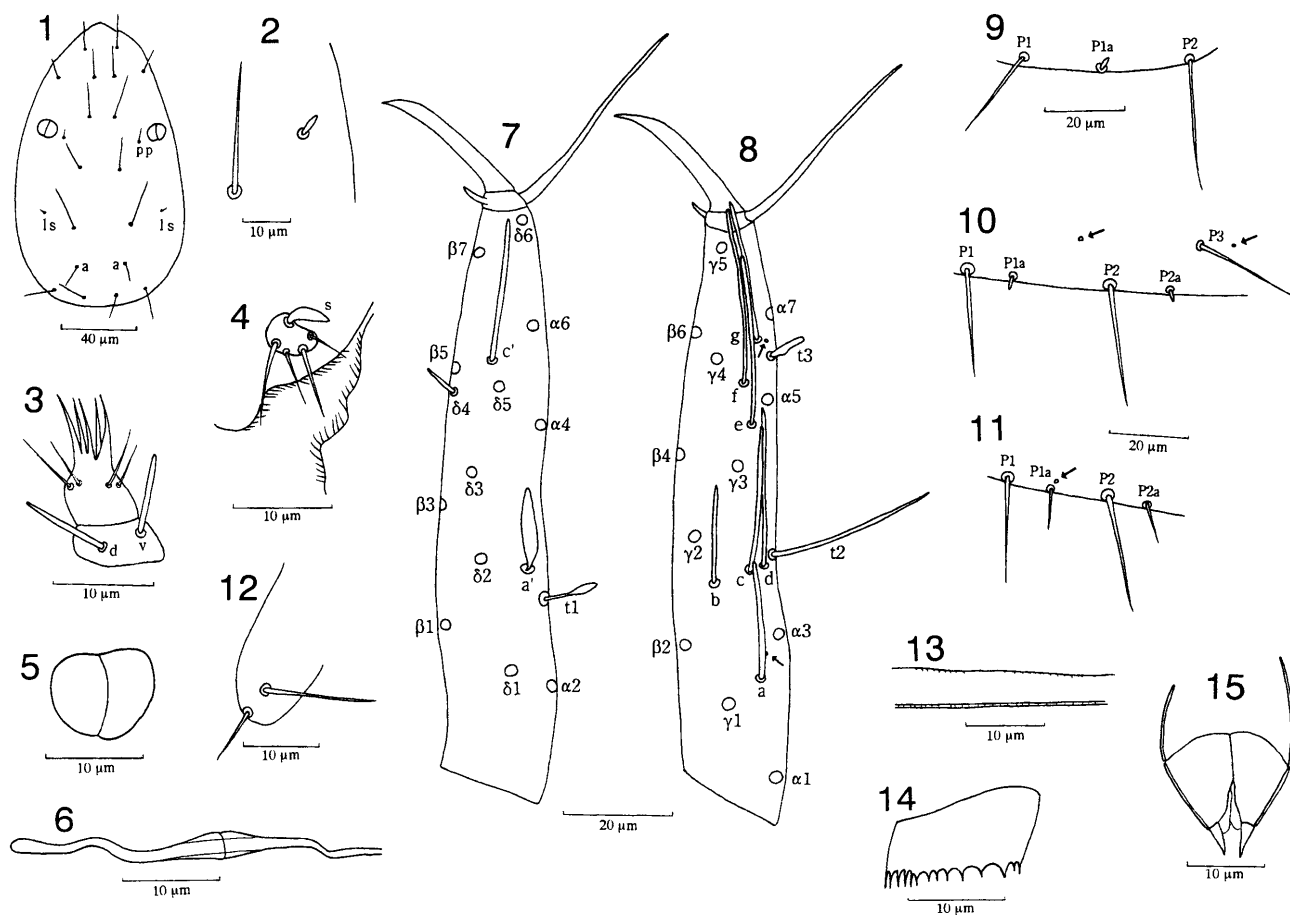
Head: 137 (128) µm × 85 µm; setae *a* and *pp* present

and *ap* absent (Fig. 1); seta *ls* short and lanceolate (Fig. 2); rostrum not protruded. Maxillary palpus with two sensilla, *d* and *v*, which are subequal in shape and length, about 9 μ m (Fig. 3). Praelabium with a distinct row of teeth along median edge (Fig. 4). Labial palpus rudimentary, with four setae and a broad sensillum *s* (Fig. 4). Pseudoculus broader than long (Fig. 5), 9.2 μ m \times 10.5–11.2 μ m, PR = 13.9–14.9. Canal of maxillary gland simple (Fig. 6).

Legs: Foretarsus (Figs. 7, 8) 109 (107) μ m; claw 30 (28) μ m and lacking inner flap, TR = 3.9 (3.8); empodium 3.9 (3.3) μ m, EU = 0.13 (0.12); S-shaped seta longer than claw, 40 (35) μ m. Sensillum *t1* baculiform, BS = 0.52 (0.57); *t2* thin; *t3* lanceolate and relatively long; *a* reaching base of *c*; *b* short and not surpassing $\gamma3$; *c* at almost the same level with *t2* and reaching base of *e*; *d* close to

c; *e* not surpassing tarsus; *f* situated at almost halfway between *e* and *g*; both apices of *f* and *g* surpassing tarsus; *a'* broad and distal to *t1*; *b'* absent; *c'* thin and not surpassing tarsus. Seta $\delta4$ short and sensillum-like. A pore existing between *a* and $\alpha3$ as well as close to *g*. Middle tarsus 52 (54) μ m, its claw 22 μ m; hind tarsus 56 (60) μ m, its claw 24 (23) μ m.

Body: Chaetotaxy as in Table 1 and Figs. 9–11. P3 on abdominal tergites II–VI situated a little anterior to other principal setae. P5a on thoracic tergites II and III minute, about 2 μ m and rudimentary, respectively; setae A2 and M2 on thoracic sternite I and A2, A4 and P2 on thoracic sternites II and III short and sensillum-like, about 5 μ m; P1a and 2a on thoracic tergites II and III, P1a, 2a and 4a on abdominal tergites I–VI, and P2 on abdominal sternite I short and lanceolate, about 3 μ m; accessory



Figs. 1–15. *Baculentulus borealis* sp. nov., holotype. 1, head, dorsal view. 2, lateral seta on head. 3, maxillary palpus. 4, median part of praelabium. 5, pseudoculus. 6, canal of maxillary gland. 7, foretarsus, interior view. 8, foretarsus, exterior view. 9, posterior setae on thoracic tergite III. 10, posterior setae on abdominal tergite VI. 11, posterior setae on abdominal tergite VII. 12, abdominal appendage III. 13, striate band on abdominal segment VIII. 14, comb on abdominal tergite VIII. 15, female squama genitalis. Arrows indicate pores.

Table 1. Chaetotaxy of *Baculentulus borealis* sp. nov.

		Maturus junior		Imago	
		Formula	Composition of setae	Formula	Complementary setae
(Dorsal)					
Thorax	I	4	1, 2	4	
	II–III	6	A2, 4, M	6	
		16	P1, 1a, 2, 2a, 3, 4, 5, 5a	16	
Abdomen	I	4	A1, 2	4	
		–	P1, 1a, 2, 2a, 3, –	12	P5
	II–III	6	A1, 2, 5	6	
		14 (16)	P1, (1a), 2, 2a, 3, 4, 4a, 5	16	P1a
	IV–V	6	A1, 2, 5	8	A4
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	16	
	VI	8 (6)	A1, 2, (4), 5	8	A4
		16 (14)	P1, (1a), 2, 2a, 3, 4, 4a, 5	16	P1a
	VII	8	A1, 2, 4, 5	8	
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	18	
	VIII	6–7	A1, 4, 5, Mc, 2, 3, 4	6–8	–Mc, +M1
		8	P2, 3, 4, 5	8	
	IX	12	1, 2, 3, 3a, 4, 5	14	4a
	X	8	1, 3, 4, 5	12	2, 3a
	XI	6	1, 2, 3	6	
	Telson	9	c, 1, 2, 3, 4	9	
(Ventral)					
Thorax	I	4–4	A1, 2, M1, 2	4–4	
		6	P1, 2, 3	6	
	II–III	7–2	Ac, 2, 3, 4, M	7–2	
		4	P1, 2	4	
Abdomen	I	–		3	Ac, 2
		–		4	P1, 2
	II–III	3	Ac, 2	3	
		5	Pc, 2, 3	5	
	IV–VII	3	Ac, 2	3	
		8	P1, 1a, 2, 3	8	
	VIII	4	1, 2	4	
		2	P	2	
	IX	4	1, 2	4	
	X	4	1, 2	4	
	XI	2	2	6	1, 3
	Telson	6	1, 2, 3	6	

setae on abdominal tergites VII (P1a, 2a, 3a and 4a) longer than those on II–VI, 8–10 μ m and seta-like.

Integumental pores distinct (Figs. 9–11). Thoracic tergite II with two pairs of pores, of which one is between A2 and P3 and the other posterior to P4. Abdominal tergites I and II with a pair of pores anterior to P1a; III–VI each with two pairs of pores lateroanterior to P2 and lateral to P3, respectively; VII with two pairs of pores close to P1a and P3a, respectively; II–VI with a pair of anterolateral pores (sensu Szeptycki, 1988); II–VII with a pair of rotary wheels R at anterior part of pleura; VIII with a pair of pores between M2 and M3 without pectinates. Sternites V and VI with a pair of pores close to P1; VII with a pair of pores close to one of P1. Telson

with a dorsal central pore and a pair of ventral pores at both sides.

Abdominal appendages II and III each with two setae, apical setae subequal to a half of subapical one in length (Fig. 12). On abdomen VIII, striate band reduced, anterior line with scattered minute tubercles (Fig. 13); comb slightly oblique and with about 14 teeth (Fig. 14). Ventral hind margin of telson with microteeth. Female squama genitalis with pointed acrostylus (Fig. 15). Male unknown.

Holotype. Female, Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 135°10'N, 48°10'E, 600 m alt., 9-IX-2000, M. Hasegawa leg.

Paratype. Female, same data as for holotype.

Other specimen examined. 1 maturus junior (mj), loc. 1, Khabarovsk, 9-IX-2000, M. Hasegawa leg.

Maturus junior. Body length 741 μm ; head 113 μm \times 76 μm ; pseudoculus 7.2–7.9 μm , PR = 15.6. Position and shape of foretarsal sensilla almost the same with those of imagoes. Foretarsus 88 μm , claw 26 μm , TR = 3.6, EU = 0.15, BS = 0.5. Middle tarsus 42 μm , its claw 19 μm ; hind tarsus 47 μm , its claw 20 μm .

Remarks. The genus *Baculentulus* consists of 33 species and is distributed in Southwest and East Asia, North and South America, East Africa and Australia. Among them, the present new species is similar to *B. densus* (Imadaté, 1960), and *B. sakayorii* Nakamura, 1995, both from Japan, *B. loxoglenus* Yin, 1980 from China and Japan, and *B. weinerae* Szeptycki & Imadaté, 1987 from North Korea, in possessing short sensillum *b* and lacking *b'* on foretarsus. However, the present species is distinguished from these four by having four setae on labial palpus (three setae in other four) and four pairs of anterior setae on abdominal tergites IV–VI (three pairs in other four), the shape of P1a on the tergite VII (sensillum-like in other four) and the presence of posterior setae on sternite VIII (absent in other four).

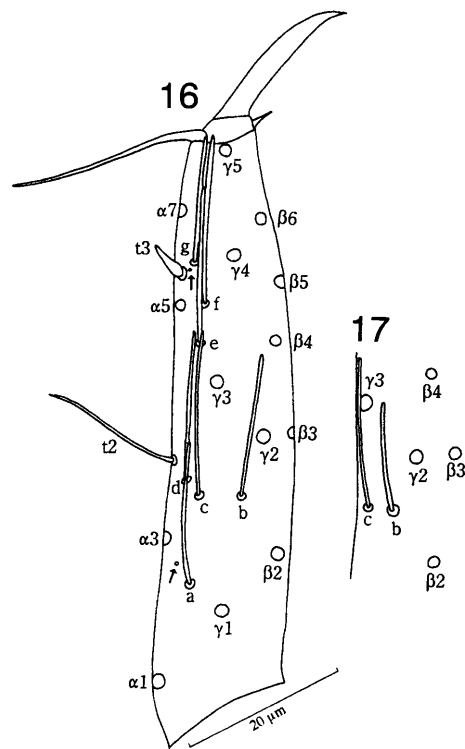
Etymology. The specific name is derived from the “boreal” forest, in which the present species was collected.

***Baculentulus loxoglenus* Yin, 1980**
(Figs. 16, 17)

Baculentulus loxoglenus Yin, 1980: 148–151, 155–156, 1999: 226–227; Nakamura, 1995: 333–339.

Specimens examined. 3 males, 3 females, loc. 2, 9-IX-2000, M. Hasegawa leg.

Remarks. The important specific features such as chaetotaxy, mouthparts, position and shape of foretarsal sensilla and distribution of integumental pores of the Khabarovsk specimens almost agreed with those of Chinese and Japanese specimens. Of six specimens examined, however, two males have relatively long *b* surpassing the base of $\gamma 3$ and almost reaching the base of $\beta 4$ (Fig. 16), differing from Chinese and Japanese ones. Moreover, these specimens examined are different from Japanese ones in the presence of P2 on abdominal sternite I (absent in Japanese ones (Nakamura, 1995)). Measurements of Khabarovsk specimens are as follows: foretarsal length = 68–74 μm , PR = 16.0–17.1, TR = 3.1–3.7, EU =



Figs. 16–17. *Baculentulus loxoglenus* Yin from Khabarovsk. 16, foretarsus, exterior view. 17, median part of foretarsus of another specimen of same type with that of China and Japan, exterior view.

0.16–0.17 and BS = 0.52–0.54.

Distribution. China (Heilongjiang, Liaoning), Japan (Honshu), new to Russian Far East.

***Filientomon duodecimsetosum* sp. nov.**
(Figs. 18–28)

Body length: 850 μm .

Head: 147 μm \times 94 μm in dorsal view; seta *a* absent (Fig. 18); rostrum not protruded; a median and two anterior pores present (Fig. 18). Maxillary palpus with two sensilla, *d* and *v*, which are subequal in length (8 μm), but *v* slightly thicker than *d* (Fig. 19). Praelabium with fringes *f* at base of distal setae, and a distinct row of minute tubercles *t* along median edge (Fig. 20). Labial palpus apically ornamented with a tuft of setae, with three setae and a thick sensillum *s* (Fig. 20). Pseudoculus broader than long (Fig. 21), 7.9 μm \times 10.5 μm , PR = 18.6. Canal of maxillary gland with one appendix (Fig. 22).

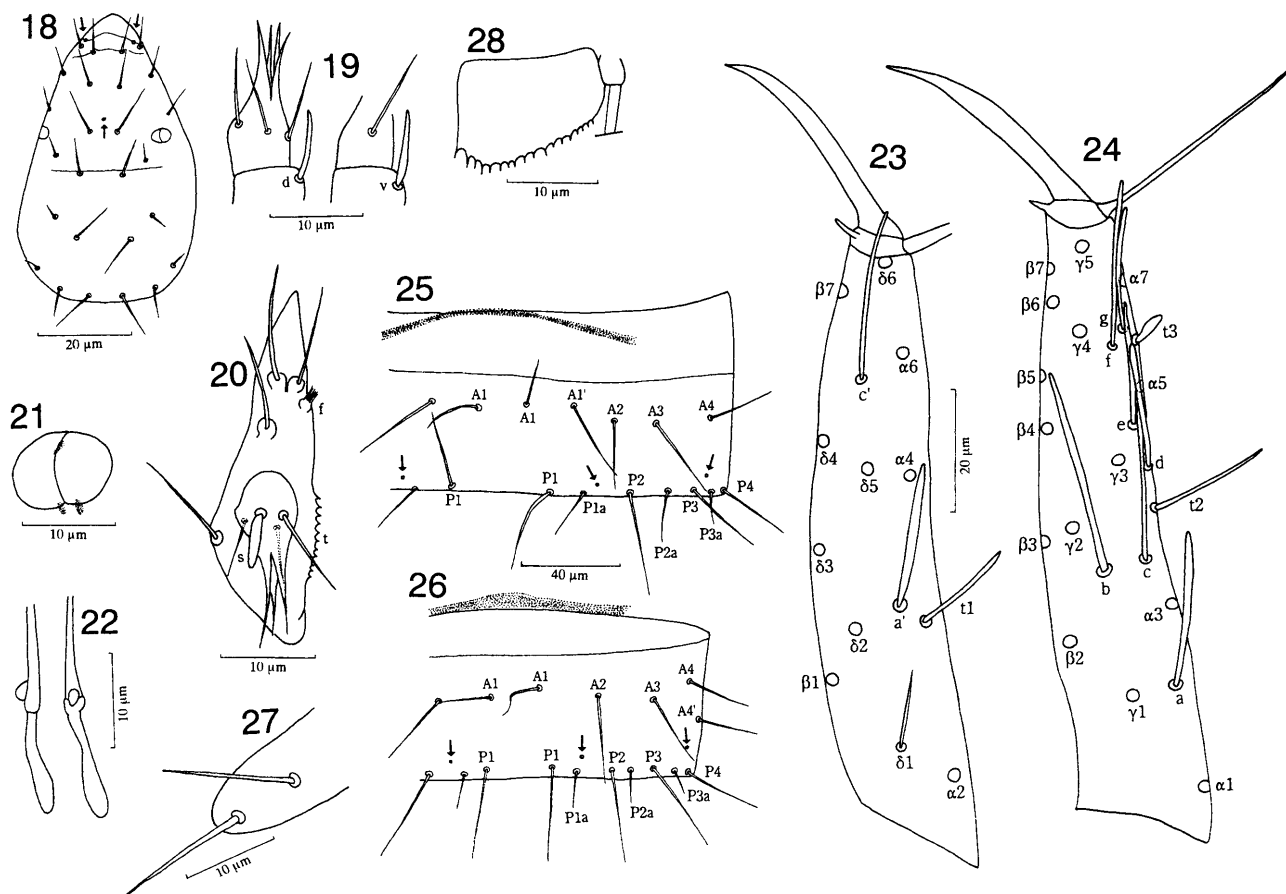
Legs: Foretarsus (Figs. 23, 24) 104 μm ; claw without

inner flap, 39 μm , TR = 2.7; empodium 4 μm , EU = 0.1; S-shaped seta subequal to claw in length. Sensillum $t1$ filiform, BS = 0.7; $t2$ thin; $t3$ small and lanceolate; a a little thick and surpassing base of c ; b long and surpassing base of e ; c surpassing base of e ; d near to e than c , situated at about halfway between $t2$ and e and almost reaching base of $t3$; e surpassing base of g ; f and g close to each other, both apices surpassing tarsus, f longer than g ; a' a little thick and slightly distal to $t1$; b' absent; c' thin and surpassing tarsus. Seta $\delta 1$ short. Middle tarsus 56 μm , its claw 24 μm ; hind tarsus 62.5 μm , its claw 25 μm .

Body: Chaetotaxy as in Table 2 and Figs. 25, 26. Abdominal tergites II–VI each with six pairs of anterior setae, A1, 1', 2, 3, 4 and 5; VII also with six pairs, A1, 2, 3, 4, 4' and 5; P3 on II–VII situated in the same row with

P1, 2 and 4; P1a, 2a, 3a and 4a on II–VII present. Sternite VIII with a single row of four setae; IX–XI with four setae. Dorsal P5a on thoracic tergites II and III minute and rudimentary, respectively; other accessory setae on thoracic tergites II and III and abdominal tergites I–VII all seta-like and longer than 1/3 of P1.

Integumental pores distinct (Figs. 25, 26). Thoracic tergite II with a pair of pores between A3 and P2a; III with two pairs of pores, of which one is between A3 and P2 and the other lateroanterior to P2a; sternites II and III with four pores posterior to Ac. Abdominal tergites I–V with a pair of pores between P1a and P2; VI with a pair of pores lateroanterior to P1a and P3a; VII with two pairs of pores, one being lateroanterior to P1a and the other anterior to P4; II–VII with a pair of anterolateral pores; VIII with a pair of pores between M2 and M3 and with



Figs. 18–28. *Filientomon duodecimsetosum* sp. nov., holotype. 18, head, dorsal view. 19, maxillary palpus, dorsal (left) and ventral (right) views. 20, praelabium. 21, pseudoculus. 22, canal of maxillary gland, lateral (left) and dorsal (right) views. 23, foretarsus, interior view. 24, foretarsus, exterior view. 25, abdominal tergite VI. 26, abdominal tergite VII. 27, abdominal appendage II. 28, comb on abdominal tergite VIII. Arrows indicate pores.

Table 2. Chaetotaxy of *Filientomon duodecimsetosum* sp. nov.

		Maturus junior		Imago	
		Formula	Composition of setae	Formula	Complementary setae
(Dorsal)					
Thorax	I	4	1, 2	4	
	II	8	A2, 3, 4, M	8	
		16	P1, 1a, 2, 2a, 3, 4, 5, 5a	16	
	III	10	A2, 3, 4, 5, M	10	
		16	P1, 1a, 2, 2a, 3, 4, 5, 5a	16	
Abdomen	I	6	A1, 2, 3	6 (7)	(one A1')
		14	P1, 1a, 2, 3, 3a, 4, 5	14	
	II-IV	8	A1, 2, 4, 5	12	A1', 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	18	P3a
	V-VI	10	A1, 2, 3, 4, 5	12	A1'
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	18	
	VII	12	A1, 2, 3, 4, 4', 5	12	
		18	P1, 1a, 2, 2a, 3, 3a, 4, 4a, 5	18	
	VIII	6-7	A1, 3, 5, Mc, 2, 3, 4	8-7	A4
		8	P2, 3, 4, 5	8	
	IX	10	1, 3, 3a, 4, 5	14	2, 4a
	X	10	1, 2, 3, 4, 5	10	
	XI	4	2, 3	6	1
	Telson	9	c, 1, 2, 3, 4	9	
(Ventral)					
Thorax	I	4-2	A1, 2, M1	4-4	M2
		6	P1, 2, 3	6	
	II	5-2	Ac, 2, 3, M	5-2	
		4	P1, 2	4	
	III	7-2	Ac, 2, 3, 4, M	7-2	
		4	P1, 2	4	
Abdomen	I	3	Ac, 2	3	
		4	P1, 2	4	
	II	3	Ac, 2	5	A3
		5	Pc, 2, 3	5	
	III	-		5	Ac, 2, 3
				5	Pc, 2, 3
	IV	-		5	Ac, 2, 3
				8	P1, 1a, 2, 3
	V	-		6 (5)	A1(+Ac, -A1), 2, 3
				8	P1, 1a, 2, 3
	VI	3 (5)	Ac, (2), 3	5	A2
		9	Pc, 1, 1a, 2, 3	9	
	VII	3	Ac, 3	5	A2
		9	Pc, 1, 1a, 2, 3	9	
	VIII	4	1, 2	4	
		0		0	
	IX	4	1, 2	4	
	X	4	1, 2	4	
	XI	2	2	4	1
	Telson	6	1, 2, 3	6	

small pectinates. Sternite II with a pore anterior to one of P2; III with a pore anterior to one of P2 and two pores anterior to one of P2; IV with a pore between Ac and one of P1a; V with a pair of pores between A1 and P1a; VI and VII each with a pair of pores lateroanterior to P1a and four pores anterior to Ac in a transverse line. Telson with a dorsal central pore and a pair of ventral pores at

both sides.

Abdominal appendages II and III each with two setae, apical and subapical setae subequal in length (Fig. 27). On abdominal tergite VIII, striate band developed; posterior margin of comb rounded and protruded distinctly backward, with about 18 teeth (Fig. 28); minute granules scattered at anterior portion. Abdominal

tergites II–VII with one transverse line; sternites III and IV with two transverse lines, lateral parts with minute teeth; V–VII with one transverse line. Ventral hind margin of telson with microteeth. Female unknown.

Maturus junior. Body length 800 μm ; head 124 μm \times 80 μm ; pseudoculus 7.2 μm \times 6.6 μm , PR = 17.2. Position and shape of foretarsal sensilla almost the same with those of imagoes. Foretarsus 90 μm , claw 34 μm with an inner flap, TR = 2.78, EU = 0.1, BS = 0.61.

Holotype. Male, Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 135°10'N, 48°10'E, 600 m alt., 9-IX-2000, M. Hasegawa leg.

Paratype. 1 mj, same data as for holotype.

Remarks. The genus *Filientomon*, distributed in Japan, China, Korea, Altai Mts. and North America (USA), contains 8 species. The present species is similar to *F. lubricum* (Imadaté, 1956) (see Imadaté, 1974) and *F. gentaroanum* Nakamura, 2001, both from Japan; all these species are distinguishable from the other congeneric species by possessing six pairs of anterior setae (A1, 1', 2, 3, 4 and 5) on the abdominal tergites II–VI. This new species is distinguished from both *F. lubricum* and *F. gentaroanum* by the absence of additional setae on head (present in other two) and the number of setae on sternite XI (6 in other two). Moreover, the present species is distinguished from *F. lubricum* in the shape of accessory setae on the abdominal tergites II–VI (short and sensillum-like in *lubricum*) and the absence of dorsal P1a' on the abdominal tergites VI–VII (present in *lubricum*), and from *F. gentaroanum* in the position of foretarsal sensillum *d* (halfway or near to *c*, and the same level as *t2* in *gentaroanum*).

Etymology. The specific name is derived from the six pairs (= 12) of dorsal anterior setae on abdominal tergites II–VII.

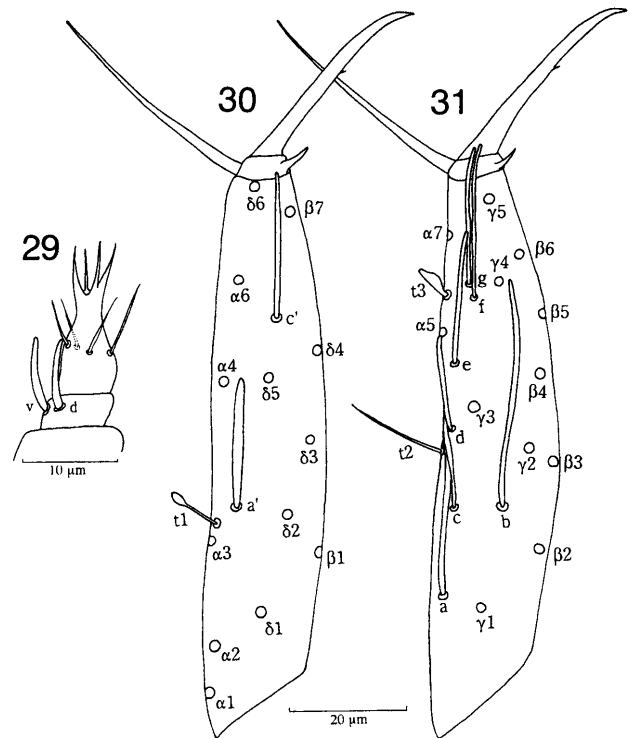
Yamatentomon kunnepchupi Imadaté, 1964
(Figs. 29–31)

Yamatentomon kunnepchupi Imadaté, 1964: 283–286; Imadaté, 1974: 118–122.

Specimen examined. 1 female, loc. 2, 9-IX-2000, M. Hasegawa leg.

Following redescription referring to mainly characters introduced by Szeptycki (1980, 1988).

Body length: 676 μm in unexpanded condition.



Figs. 29–31. *Yamatentomon kunnepchupi* Imadaté from Khabarovsk. 29, maxillary palpus. 30, foretarsus, interior view. 31, foretarsus, exterior view.

Head: 124 μm \times 81 μm in dorsal view; seta *a* absent; a median pore present. Maxillary palpus with two sensilla, *d* and *v*, which are subequal in shape and length (about 8 μm) (Fig. 29).

Legs: Foretarsus (Figs. 30, 31) 85.5 μm ; claw with a small inner flap, 34.2 μm , TR = 2.6; empodium 4.6 μm , EU = 0.13; S-shaped seta slightly longer than claw, 36.2 μm ; BS = 0.63. Sensillum *b* slightly thick, long and reaching base of $\gamma 4$; *e* reaching $\alpha 7$. Middle tarsus 36.8 μm , its claw 20.4 μm ; hind tarsus 41.5 μm , its claw 21.1 μm .

Body: P5a on thoracic tergites II and III minute and rudimentary, respectively; other accessory setae on thoracic tergites II and III and abdominal tergites I–VII almost 1/3 length of P1, seta-like.

Integumental pores distinct. Thoracic tergites II and III with a pair of pores between A3 and P2a; sternites II and III with three pores posterior to Ac. Abdominal tergite I with a pair of pores lateroanterior to P1a; II–VI with a pair of pores between P1a and P2; VII with two

pairs of pores anterior to P1a and P3, respectively; VIII with a pair of pores between M2 and M3 with small teeth. Sternites III–V with a pore posterior to Ac; VII with a pore anterior to one of P1. Telson with a dorsal central pore and a pair of ventral pores at both sides. Ventral hind margin of telson with microteeth.

Notes. The present specimen is slightly different from the specimens from Japan (see Imadaté, 1974) in the relative length of the foretarsal sensilla *b* and *e* (not reaching the base of $\gamma 4$ and $\alpha 7$, respectively, in Japanese specimens).

Distribution. Japan (Hokkaido), new to Russian Far East.

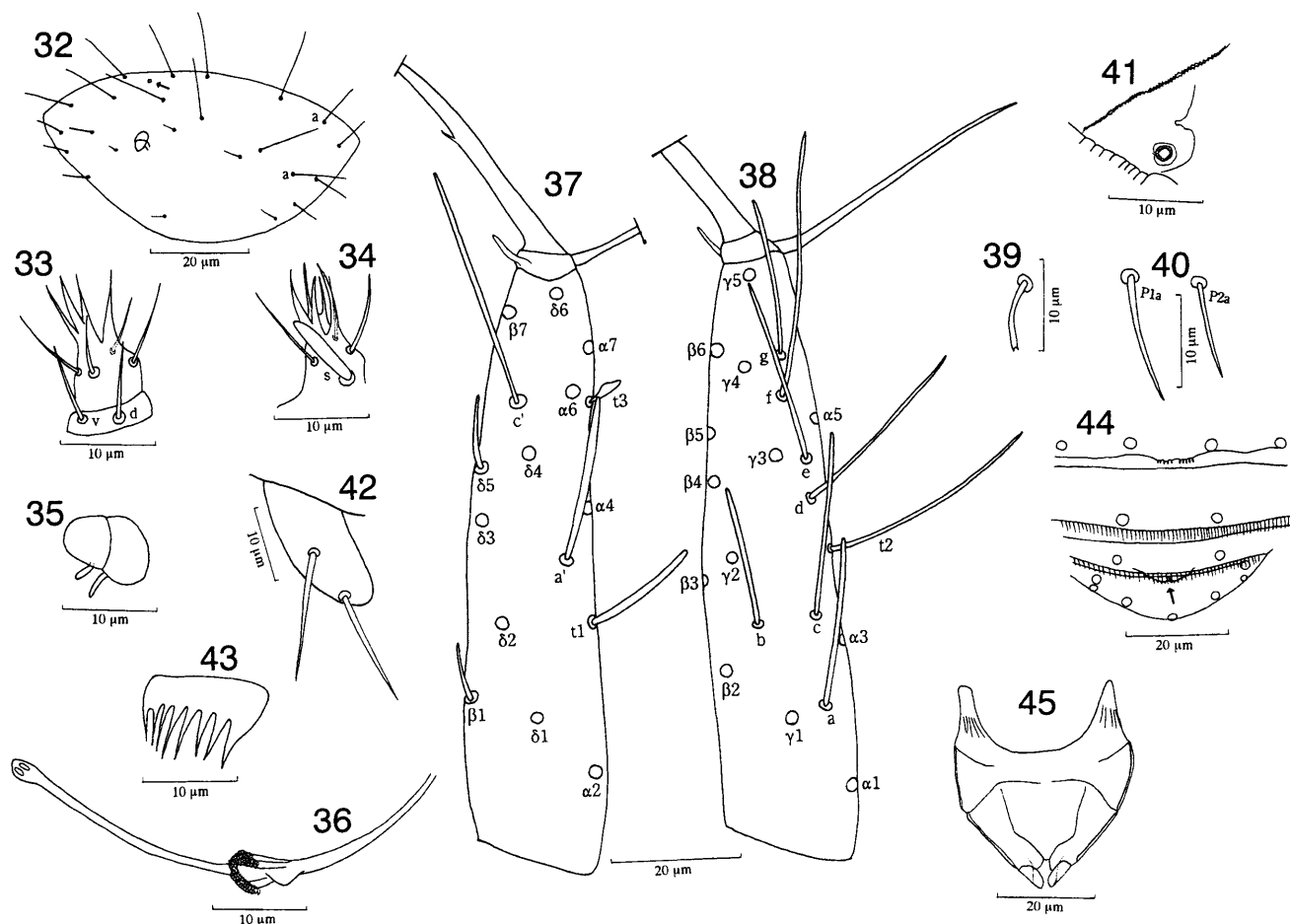
***Nipponentomon khabarovskense* sp. nov.**

(Figs. 32–55)

Body length: (970–) 975 (–1287) μm .

Head: (144–) 156 μm \times (88–98) μm in dorsal view; seta *a* present (Fig. 32); rostrum not protruded; a median pore present (Fig. 32). Maxillary palpus with two sensilla, *d* and *v*, which are subequal in shape (pointed and seta-like) and length (about 8 μm) (Fig. 33). Labial palpus with a tuft of setae, three setae and a thick sensillum *s* (Fig. 34). Pseudoculus with two levers, broader than long (Fig. 35), (6.2–) 6.6 (–7.2) μm \times 7.9 (–9.8) μm ; PR = (20.8–) 23.7 (–23.8). Canal of maxillary gland with racemose appendices and an extra appendix (Fig. 36).

Legs: Foretarsus (Figs. 37, 38) (90–) 94 (–99) μm ; claw



Figs. 32–45. *Nipponentomon khabarovskense* sp. nov. 32, head. 33, maxillary palpus. 34, labial palpus. 35, pseudoculus. 36, canal of maxillary gland. 37, foretarsus, interior view. 38, foretarsus, exterior view. 39, seta P1a on thoracic tergite II. 40, setae P1a and P2a on abdominal tergite VI. 41, rotary wheel on abdominal tergite VI. 42, abdominal appendage II. 43, comb on abdominal tergite VIII. 44, abdominal tergites IX-telson. 45, female squama genitalis. Arrows show pores. 32–43, holotype; 45, allotype; 44, paratype.

with an inner flap, (40–) 41 (–46) μm , TR = 2.1–2.4; empodium relatively long, (5.3–) 6.6 (–7.2) μm , EU = (0.12–) 0.16; S-shaped seta slightly shorter than claw. Sensillum *t1* thickly filiform, BS = (0.68–) 0.72 (–0.75); *t2* thin; *t3* small and lanceolate; *a* slightly surpassing base of *t2*; *b* shorter than *c*; *c* surpassing base of *e*; *d* close to *e*; *e* almost reaching base of $\gamma 5$; *f* near to *g* than *e*, surpassing tarsus; *g* surpassing tarsus; *a'* distal to *t1*, almost at *t2*, reaching base of $\alpha 6$; *b'* absent; *c'* long and surpassing tarsus. Setae $\beta 1$ and $\delta 5$ both short and

sensillum-like. Middle tarsus (47–) 50 (–51) μm , its claw (23–) 24 (–25) μm ; hind tarsus (54–) 56 (–60) μm , its claw (24–) 26 (–28) μm .

Body: Chaetotaxy as in Table 3. Abdominal tergites II–VI each with five pairs of anterior setae, A1, 2, 3, 4 and 5; VII with four pairs of anterior setae, A2, 3, 4 and 5; P3 on II–VII situated in the same row with P1, 2 and 4; P1a, 2a and 4a on II–VI present; P2a and 4a on VII present. Sternite VIII with double rows of setae, four middle and two posterior ones. P5a on thoracic tergites

Table 3. Chaetotaxy of *Nipponentomon khabarovskense* sp. nov.

		Larva I		Larva II		Maturus junior		Imago	
		Formula	Primary setae	Formula	Secondary setae	Formula	Tertiary setae	Formula	Complementary setae
(Dorsal)									
Thorax	I	4	1, 2	4		4		4	
	II	4	A2, M	6	A4	8	A3	8	
		10	P1, 2, 3, 4, 5a	14	P1a, 5	16	P2a	16	
III		4	A2, M	6	A4	8 (10)	(A1), 3	10	A1
		10	P1, 2, 3, 4, 5a	14	P1a, 5	16	P2a	16	
Abdomen I		0		0		6	A1, 2, 5	6	
		8	P1, 2, 3, 5	10	P2a	12	P1a	12	
II–V		0		0		8 (6)	A1, 2, (4), 5	10	A3, A4
		10	P1, 2, 3, 4, 5	14	P2a, 4a	16	P1a	16	
VI		0		0		10	A1, 2, 3, 4, 5	10	
		10	P1, 2, 3, 4, 5	14	P2a, 4a	16	P1a	16	
VII		0		0		6	A2, 4, 5	8	A3
		10	P1, 2, 3, 4, 5	14	P2a, 4a	14		14	
VIII		0–6	M2, 3, 4	2–7	A3, Mc	6–7	A1, 5	6–7	
		6	P2, 3, 5	8	P4	8		8	
IX				8	1, 3, 4, 5	10	2	12	3a
X						8	1, 3, 4, 5	10	2
XI						6	1, 2, 3	6	
Telson		9	c, 1, 2, 3	9		9		9	
(Ventral)									
Thorax I		2–2	A1, M1	2–2		2–4	M2	4–4	A2
		4	P1, 2	4		6	P3	6	
II		5–0	Ac, 2, 3	5–2	M	5–2		5–2	
		–	–	2	P1	4	P2	4	
III		5–0	Ac, 2, 3	5–2	M	7–2	A4	9–2	A5
		2	P1	2		4	P2	4	
Abdomen I		–	–	3	Ac, 2	3		3	
		–	–	2	P1	4	P2	4	
II		0		1	Ac	3	A2	3	
		3	Pc, 3	3		5	P2	5	
III		0		1	Ac	3	A2	3	
		3	Pc, 3	4	–Pc,+P1	6	P2	6	
IV–VI		1	Ac	1		3	A2	5	A3
		4	P2, 3	6	P1	8	P1a	8	
VII		0		1	Ac	3	A2	3	
		4	P2, 3	6	P1	8	P1a	9	Pc
VIII		2	2	4	1	4		4	
		0		0		0		2	P
IX				4	1, 2	4		4	
X						4	1, 2	4	
XI						2	2	6	1, 3
Telson		8	A, 1, 2, 3	8		6	–A	6	

II and III minute (about 5 μm) and rudimentary (about 2 μm), respectively; other accessory setae on thoracic tergites II and III and abdominal tergites I–V all short, less than 1/8 of P1, sensillum-like and often apically bifid (Fig. 39); those on abdominal tergites VI and VII slightly longer than those of abdominal tergites I–V, about 1/5 of P1, seta-like (Fig. 40).

Integumental pores distinct. Thoracic tergites II and III with two pairs of pores, of which one is between A2 and P2a and the other anterior to P4; sternites II and III each with a pore posterior to Ac. Abdominal tergite I with a pair of pores between P1a and P2; II–VII each with two pairs of pores, one being between P1a and P2 and the other anterior to P4, and with a pair of rotary wheels R at anterior part of pleura (Fig. 41); VIII with a pair of pores between M2 and M3 with small teeth. Sternites I–IV each with a pore between both P1; V and VI with a pore posterior to Ac; VII with a pore anterior to Pc. Telson with a dorsal central pore on a serrate line.

Abdominal appendages II and III each with two setae, subequal in length (Fig. 42). On abdominal segment VIII, striate band developed; small pectinates scattered in anterior portion; comb with about 8 teeth (Fig. 43). Hind margin of abdominal segments IX–XI with numerous fine teeth (Fig. 44). Ventral hind margin of telson with microteeth. Female squama genitalis with stout acrostylus (Fig. 45).

Holotype. Male, Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 600 m in altitude, 135°12'N, 48°15'E, 9-IX-2000, M. Hasegawa leg.

Allotype. Female, same data as for holotype.

Paratypes. 5 males, 7 females, same data as for holotype; a female, Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 135°10'N, 48°10'E, 600 m alt., 9-IX-2000, M. Hasegawa leg.

Other specimens examined. 2 males, 4 preimagos (male), 3 mj, 3 Larvae II (LII), 1 Larva I (LI), same date as for holotype.

Preimago. Body length 709–995 μm ; head 121–126 μm \times 81–92 μm ; pseudoculus 5.9–7.2 μm \times 6.9–8.6 μm , PR = 17.2–20.5. Foretarsus 83–85 μm ; claw 30–38 μm , TR = 2.3–3.0; empodium 4.6–5.9 μm , EU = 0.14–0.16; S-shaped setae 29–33 μm ; BS = 0.6–0.7; middle tarsus 39–47 μm , claw 21–22 μm ; hind tarsus 45–49 μm , claw 21–22 μm .

Maturus junior. Body length 722–995 μm ; head 116–

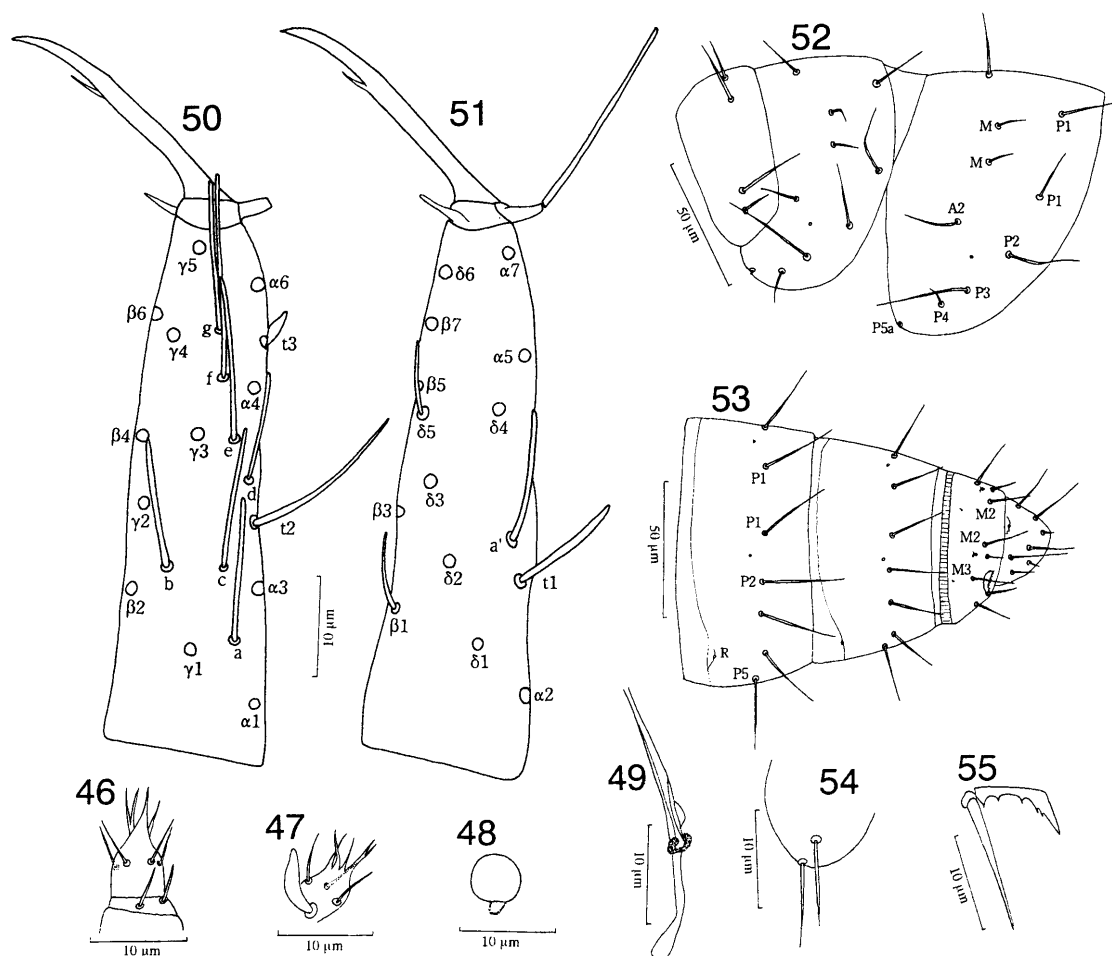
129 μm \times 80–86 μm ; pseudoculus 5.9–6.6 μm \times 7.2–7.9 μm , PR = 17.7–21.0. Foretarsus 78–81 μm ; claw 34–36 μm , TR = 2.2–2.5; empodium 4.6–5.3 μm , EU = 0.14–0.15; S-shaped setae 29–33 μm ; BS = 0.63–0.67; middle tarsus 33–43 μm , claw 17–20 μm ; hind tarsus 43–46 μm , claw 20–22 μm .

Larva II. Body length 618–793 μm ; head 110 μm \times 69–75 μm ; pseudoculus 5.9–6.9 μm \times 5.9–6.6 μm , PR = 16–20. Foretarsus 66–67 μm , claw 28–30 μm , TR = 2.3–2.5; empodium 4.0–4.9 μm , EU = 0.14–0.19; S-shaped setae 24–26 μm ; BS = 0.55–0.64; middle tarsus 36 μm , claw 18 μm ; hind tarsus 37–40 μm , claw 17–20 μm .

Larva I. Body length 572 μm ; head 98 μm \times 70 μm ; mouthparts (Figs. 46, 47), canal of maxillary gland (Fig. 49) and abdominal appendages II–III (Fig. 54) similar to those of the succeeding stages; pseudoculus almost circular with a lid (Fig. 48), 4.6 \times 4.6 μm , PR = 21.3. Foretarsus (Figs. 50, 51) 55.9 μm ; claw 28.3 μm , TR = 1.98; empodium 4.6 μm , EU = 0.16; S-shaped seta 24.3 μm ; BS = 0.55; sensillum c' absent; middle tarsus 30 μm , claw 18 μm ; hind tarsus 34.2 μm , claw 17.8 μm . On abdominal tergite VIII, comb slender (Fig. 55); a few minute granules scattered at anterior portion (Fig. 53). Thoracic tergites II and III with a pair of pores between A2 and P3 (Fig. 52); abdominal tergites II–VII with a pair of pores between P1 and P2 and with a pair of R (Fig. 53); VIII with a pair of pores between M2 and M3 with small teeth (Fig. 53). Telson with a dorsal central pore on a serrate line (Fig. 53).

Remarks. The genus *Nipponentomon* includes 10 species and is distributed in Japan, China, Korea and North America (Canada and USA). This new species is similar to *N. bifidum* Rusek, 1974 from Canada in the lack of the dorsal setae P1a' and P2a' on thoracic tergites II and III and the presence of the sensillum-like accessory setae on abdominal tergites II–V, but it is distinguishable from the latter by the characters shown in Table 5.

Of the 16 imagoes examined, chaetotaxial variations were observed in 14 specimens, for example, asymmetric absence or presence of A1, 4, 5 and P1a on abdominal tergites I, VII and VIII and so on. As for maturus junior, chaetotaxial variations were seen in all specimens; symmetric or asymmetric presence/absence of A1, M, P1a and 2a on thoracic tergite II, A1 on abdominal tergite IV, A2 on V, A3 on VI and so on. In one larva II, one of ventral seta A on telson was absent. Chaetotaxial variation



Figs. 46–55. Larva I of *Nipponentomon khabarovskense* sp. nov. 46, maxillary palpus. 47, labial palpus. 48, pseudoculus. 49, canal of maxillary gland. 50, foretarsus, exterior view. 51, foretarsus, interior view. 52, thoracic tergites I–III. 53, abdominal tergites VI–telson. 54, abdominal appendage II. 55, comb on abdominal tergite VIII.

seems to be very frequent in this species.

Etymology. The specific name is derived from the type locality, Khabarovsk.

***Nipponentomon bidentatum* sp. nov.**

(Figs. 56–69)

Body length: 1138 (1241) μ m.

Head: 156 (160) μ m \times 96 μ m in dorsal view; seta *a* absent (Fig. 56). Mouthparts (Figs. 57, 58) and canal of maxillary gland (Fig. 59) similar to those of preceding species. Pseudoculus with a lever, broader than long (Fig. 60), 7.2 (6.6) μ m \times 9.9 μ m, PR = 22 (24).

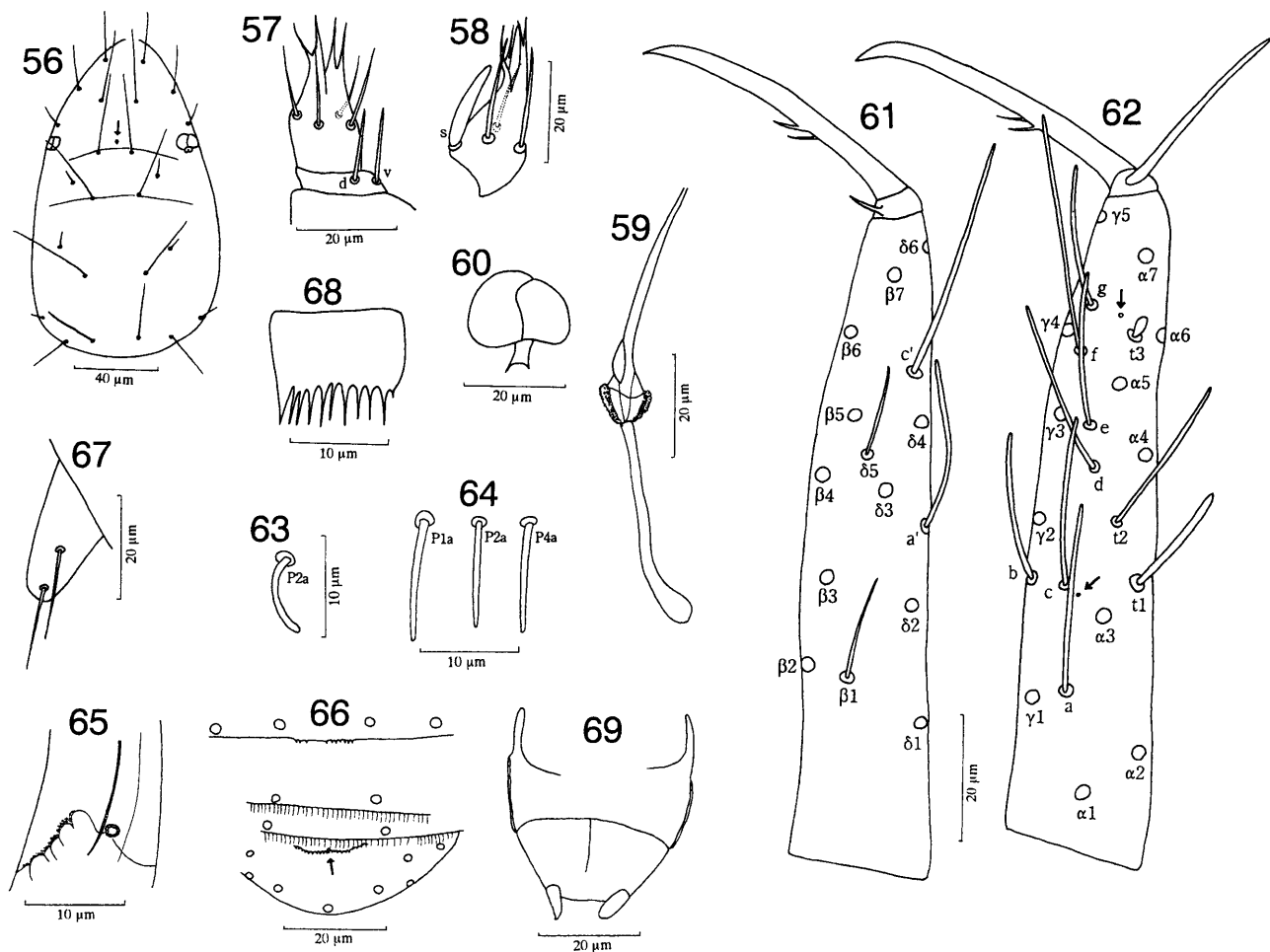
Legs: Foretarsus (Figs. 61, 62) 104 (108) μ m; claw with two inner flaps, 47 (49) μ m, TR = 2.2; empodium 6.6

(4.6) μ m, EU = 0.14 (0.10); S-shaped seta shorter than claw, 37 (30) μ m. Position and shape of foretarsal sensilla and setae β 1 and δ 5 similar to those of preceding species, except relative length of sensillum *e*. A pore existing between *c* and α 3 as well as between *t*3 and *g*. Middle tarsus 55 μ m, claw 24 (26) μ m; hind tarsus 66 (60) μ m, claw 28 (27) μ m.

Body: Chaetotaxy similar to that of preceding species (Table 4), but P3a on abdominal tergites II–VII absent and accessory setae on thoracic tergites II and III and abdominal tergites I–V blunt, not bifid (Figs. 63, 64).

Distribution of integumental pores similar to those of preceding species (Figs. 65, 66).

Abdominal appendages II and III (Fig. 67), striate band, hind margin of abdominal segments IX–XI (Fig.



Figs. 56–69. *Nipponentomon bidentatum* sp. nov. 56, head, dorsal view. 57, maxillary palpus. 58, labial palpus. 59, canal of maxillary gland. 60, pseudoculus. 61, foretarsus, interior view. 62, foretarsus, exterior view. 63, seta P2a on abdominal tergite IV. 64, setae P1a, P2a and P4a on abdominal tergite VII. 65, rotary wheel on abdominal tergite VII. 66, abdominal tergites IX–telson. 67, abdominal appendage III. 68, comb on abdominal tergite VIII. 69, female squama genitalis. Arrows indicate pores. 56–60, 63–68, holotype; 61, 62, 69, paratype.

66) similar to those of preceding species. Comb on abdominal tergite VIII square with 11 teeth (Fig. 68). Female squama genitalis with stout acrostylus (Fig. 69).

Holotype. Male, Khekhtsy Experimental Forestry Enterprise, Korfovsky, Khabarovsk, 600 m alt., 135°12' N, 48°15' E, 9-IX-2000, M. Hasegawa leg.

Paratype. A female, same data as for holotype.

Remarks. This new species is similar in many respects to *N. bifidum* Rusek, 1974 from Canada and *N. khabarovskense* sp. nov., but it is distinguishable from the latter two species by the characters shown in Table 5.

Chaetotaxial variation was observed in the paratype as follows; asymmetric absences of A2 on abdominal tergite II, A3 on tergite VII, A2 on sternite IV, 1 on sternite X.

Further, the absence of ventral Pc on VII was found.

Etymology. The specific name is derived from the paired inner flaps on the foretarsal claw.

***Verrucoentomon kawakatsui* (Imadaté, 1964)**
(Figs. 70–75)

Acerella kawakatsui Imadaté, 1964: 275–276; Imadaté, 1974: 95–99.

Verrucoentomon kawakatsui: Rusek, 1974: 271.

Specimen examined. 1 male, loc. 2, 9-IX-2000, M. Hasegawa leg.

Following redescription referring to mainly characters introduced by Szeptycki (1980, 1988).

Table 4. Chaetotaxy of *Nipponentomon bidentatum* sp. nov.

		Dorsal		Ventral	
		Formula	Composition of setae	Formula	Composition of setae
Thorax	I	4	1, 2	4-4	A1, 2, M1, 2
				6	P1, 2, 3
	II	8	A2, 3, 4, M	5-2	Ac, 2, 3, M
		16	P1, 1a, 2, 2a, 3, 4, 5, 5a	4	P1, 2
	III	10	A1, 2, 3, 4, M	9-2	Ac, 2, 3, 4, 5, M
		16	P1, 1a, 2, 2a, 3, 4, 5, 5a	4	P1, 2
Abdomen	I	8	A1, 2, 3, 5	3	Ac, 2
		12	P1, 1a, 2, 2a, 3, 5	4	P1, 2
	II	10	A1, 2, 3, 4, 5	3	Ac, 2
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	5	Pc, 2, 3
	III	10	A1, 2, 3, 4, 5	3	Ac, 2
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	6	P1, 1a, 2
	IV-VI	10	A1, 2, 3, 4, 5	5	Ac, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	8	P1, 1a, 2, 3
	VII	8	A2, 3, 4, 5	3	Ac, 2
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	8 (9)	(Pc), 1, 1a, 2, 3
	VIII	6-7	A1, 3, 5, Mc, 2, 3, 4	4	1, 2
		8	P2, 3, 4, 5	2	P
	IX	12	1, 2, 3, 3a, 4, 5	4	1, 2
	X	10	1, 2, 3, 4, 5	4	1, 2
	XI	6	1, 2, 3	6	1, 2, 3
	Telson	9	c, 1, 2, 3, 4	6	1, 2, 3

Table 5. Differential characters of three related species of the genus *Nipponentomon*

	<i>N. bifidum</i>	<i>N. khabarovskense</i> sp. nov.	<i>N. bidentatum</i> sp. nov.
body length	1750 µm	970-1287 µm	1138-1142 µm
head length	180 µm	144-153 µm	156-160 µm
PR	15	20.8-23.8	21.6-24.3
additional setae on head	present	present	absent
foretarsal length	115 µm	90-99 µm	104-108 µm
inner flap on claw	1	1	2
TR	2.3	2.1-2.4	2.2
EU	?	0.12-0.16	0.10-0.14
BS	?	0.68-0.75	0.61-0.69
sensillum <i>d</i> near to	<i>t</i> 2	<i>e</i>	<i>e</i>
P3a on VI-VII	present	absent	absent
P1a on VII	present	absent	present
accessory setae on II-V	bifid	often bifid	blunt
accessory setae on VI-VII	sensillum-like	seta-like	seta-like
sternite VIII	4/0	4/2	4/2

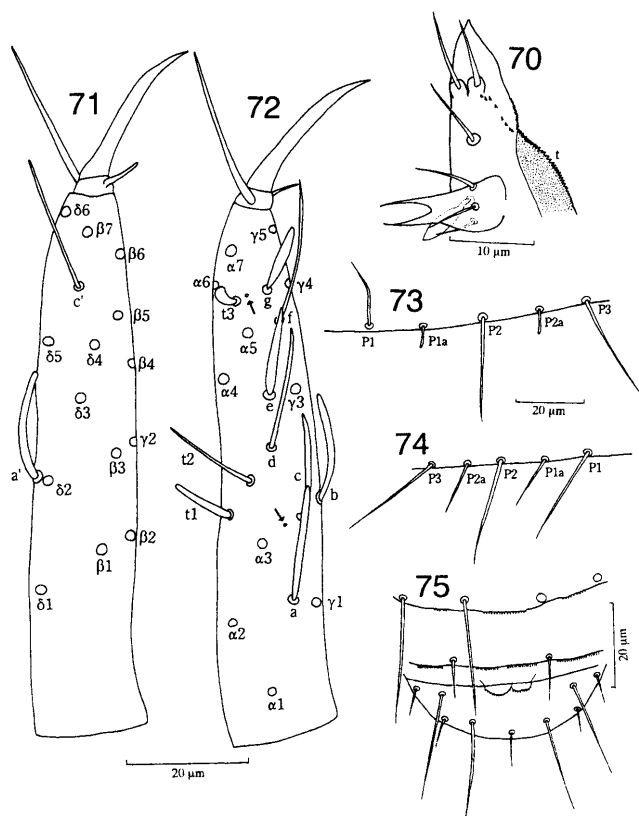
Body length: 995 µm.

Head: 132 µm × 89 µm in dorsal view; seta *a* absent; rostrum poorly protruded; a central pore and two anterior pores present; PR = 19; praelabium with a row of tubercles *t* (Fig. 70).

Legs: Foretarsus (Figs. 71, 72) 89 µm; claw 29 µm, TR = 3.2; empodium relatively long, 6.6 µm, EU = 0.23; S-shaped seta subequal to claw in length; BS = 0.76. Sensillum *b* thick, almost reaching base of γ 3 and

subequal to *d* in length; *d* slightly thin, a little near to *e* than to *c*. A pore existing between α 3 and *c* as well as between *t*3 and *g*. Middle tarsus 45 µm, claw 20 µm; hind tarsus 52 µm, claw 21 µm.

Body: Chaetotaxy as in Figs. 73-75. P5a on thoracic tergites II and III minute (about 3 µm) and rudimentary, respectively; A2 and M2 on thoracic sternite I, dorsal P1a, 2a and ventral A2 on thoracic segments II and III, A5 on abdominal tergite I, and other accessory setae on abdomi-



Figs. 70–75. *Verrucoentomon kawakatsui* (Imadaté) from Khabarovsk. 70, distal part of praelabium. 71, foretarsus, exterior view. 72, foretarsus, interior view. 73, posterior setae on abdominal tergite V. 74, posterior setae on abdominal tergite VII. 75, abdominal tergites X-telson.

nal tergites I–VI similar in shape, short and blunt, about 6 μm ; accessory setae on abdominal tergite VII and accessory ones (P1a) on abdominal sternites II–VII seta-like, apically pointed, about 16 μm .

Integumental pores distinct. Thoracic tergite II with two pairs of pores, of which one is between A3 and P2a and the other anterior to P4; III with a pairs of pores between A3 and P2a. Abdominal tergites I–VI each with a pair of pores lateroanterior to P1a; VII with two pairs of pores lateroanterior to P2 and anterior to P4, respectively; II–VII with a pair of anterolateral pores; VIII with a pair of pores between M2 and M3 with small teeth. Sternite III with a pore between Ac and Pc; IV with a pore between Ac and one of P1, and four pores posterior to Ac; V with three pores at central part; VI with a pore anterior to one of P1, and two pores between both P1; VII with a pore anterior to Pc.

Remarks. Between the present and Japanese specimens, slight discrepancies exist in the presence of tubercles on praelabium (absent in Japanese specimen) and the relative length of foretarsal sensilla *c* (shorter than *b* in Japanese specimen) and *d* (surpassing base of *f* in Japanese specimens).

Distribution. Japan (Hokkaido), new to Russian Far East.

Family Eosentomidae Berlese, 1909

Eosentomon asahi Imadaté, 1961

(Figs. 76–85)

Eosentomon asahi Imadaté, 1961: 123–131; Tuxen, 1964: 135–137; Imadaté, 1974: 308–316; Yin & Xie, 1993: 67–68 & 71; Yin, 1999: 332–335.

Specimens examined. 1 female, 4 mj, 4LII, loc. 1, 9-IX-2000, M. Hasegawa leg.

Following redescription referring to mainly characters introduced by Bernard (1990) and Szeptycki (1984).

Body length: 1235 μm .

Head: 134 μm \times 97 μm in dorsal view; setae *aa*, *pa*, *m4*, and sensilla *as* and *ps* present (Fig. 76); seta *sp* about 1.5 times longer than *p*. Clypeal apodemes distinct (Fig. 77). Seta *b* present; *rs* simple and a little shorter than *sr* (Fig. 77). Maxillary palpus with two sensilla, *l* shorter than *d* (Fig. 78). Mandible with two teeth. Digits of galea well-developed, blunt and subequal in length and shape (Fig. 79).

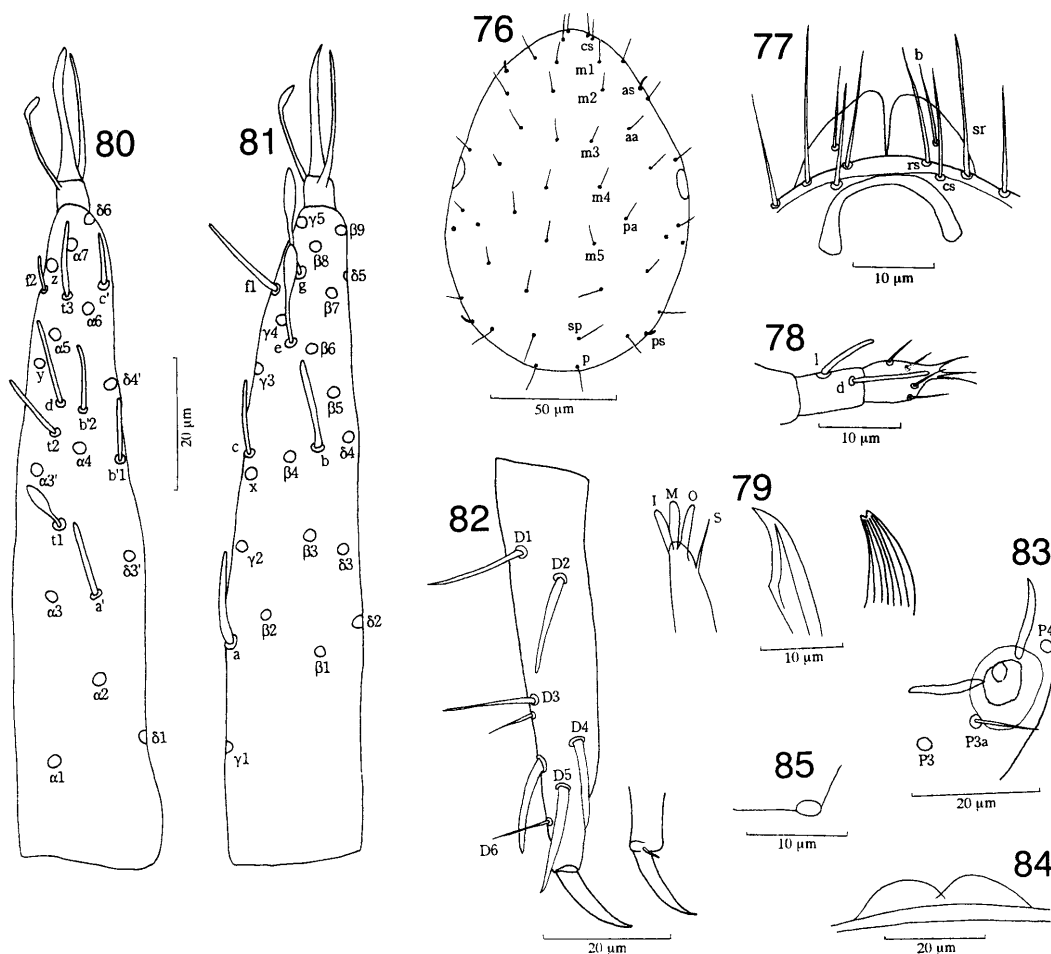
Legs: Foretarsus (Figs. 80, 81) 94.7 μm ; claw 20 μm , TR = 4.8; empodium 18 μm , EU = 0.89; S-shaped seta 16 μm ; BS = 1.1; sensillum *b'1* slightly near to $\delta 4'$ than to $\delta 3'$. Middle tarsus 49 μm , its claw 13 μm ; hind tarsus 65 μm , its claw 16 μm . On hind tarsus, setae D2 and D5 spine-like, but D2 somewhat slender than D5 (Fig. 82).

Body: Tracheal camerae slender, distally contracted (Fig. 83).

On thoracic tergite III, P5a and P5a' present. On abdominal tergite I, P3a and P3a' present, very short and sensillum-like.

Central lobe of praecosta weakly incised. (Fig. 84). Laterostigmata II–IV relatively large, lacking reticulation (Fig. 85). Abdominal tergites IX and X with openings of dermal glands. Telson with two dorsal central pores.

Maturus junior. Body length 793 μm in maximum; head 123–127 μm \times 86–93 μm ; pseudoculus 9.9–11.2 μm , PR = 11.0–12.6; foretarsus 86.8–91.8 μm , TR = 4.8–5.2, EU = 0.90–0.97, BS = 1.0–1.1; middle tarsus 44–49 μm , claw 12–14 μm ; hind tarsus 58–61 μm , claw 15–16 μm .



Figs. 76–85. *Eosentomon asahi* Imadaté from Khabarovsk. 76, head, dorsal view. 77, anterior margin of head, dorsal view. 78, maxillary palpus. 79, galea (left), lacinia (center) and mandible (right). 80, foretarsus, interior view. 81, foretarsus, exterior view. 82, hind tarsus, dorsal view (left) and distal part of hind tarsus, interior view (right). 83, trachea of thoracic tergite III. 84, praecosta on abdominal tergite VII. 85, laterostigma II

Larva II. Body length 767 μm in maximum; head 115–118 $\mu\text{m} \times 89$ –93 μm ; pseudoculus 8.2–9.2 μm , PR = 12.8–13.4; foretarsus 77–84 μm , TR = 4.8–5.1, EU = 0.89–0.96, BS = 1.1; middle tarsus 39–42 μm , claw 13–14 μm ; hind tarsus 49–52 μm , claw 14–15 μm .

Remarks. No distinct differences were found between Russian and Japanese specimens. Some chaetotaxial variations in the present specimens were observed: asymmetric absence of 3 on abdominal tergite IX and P1 on sternite VII in one female; asymmetric absence of P2a' on sternite IV and A on sternite VIII in one maturus junior.

Distribution. Japan (Hokkaido, Honshu, Sado, Okinawa and Hachijojima Islands), China (Beijing, Heilongjian, Jilin, Liaoning, Inner Mongolia), new to

Russian Far East.

Eosentomon sp. Kh
(Figs. 86–100)

Specimens examined. 2 males, 1LII, loc.1, 9-IX-2000, M. Hasegawa leg.

Body length: 800 and 832 μm .

Head: 128 and 132 $\mu\text{m} \times 91 \mu\text{m}$ in dorsal view. Head chaetotaxy (Fig. 86), clypeal apodemes (Fig. 87), and mouthparts (Figs. 88, 89) similar to those of the preceding species. Pseudoculus 9 and 11 μm with a few faint lines (Fig. 90), PR = 12 and 14.

Legs: Foretarsus (Fig. 91, 92) 97 and 100 μm ; claw 19 and 20 μm , TR = 4.9 and 5.1; empodium subequal to

claw, 18 and 21 μm , $\text{EU} = 1.0$; S-shaped seta subequal to claw, 21 μm . Sensillum $t1$ slightly nearer to $\alpha3'$ than to $\alpha3$, $\text{BS} = 1.0$ and 1.1 ; $t2$ thin; $t3$ longer than c' ; a almost reaching base of $\gamma2$; b and c a little broad; apex of d surpassing base of $\alpha5$; e and g normal, with long spatulate dilatation; $f1$ relatively long and thin; a' a little broad and situated at the same level with $\alpha3$; $b'1$ absent; c' short, apex not reaching base of $\delta6$. A pore present laterally to $\alpha3'$. Middle tarsus 50 and 51 μm , claw 14 and 16 μm ; hind tarsus 63 and 64 μm , claw 17 and 18 μm . Middle and hind empodia as in the preceding species (Fig. 93); setae D2 and D5 on hind tarsus thick and spine-like (Fig. 93).

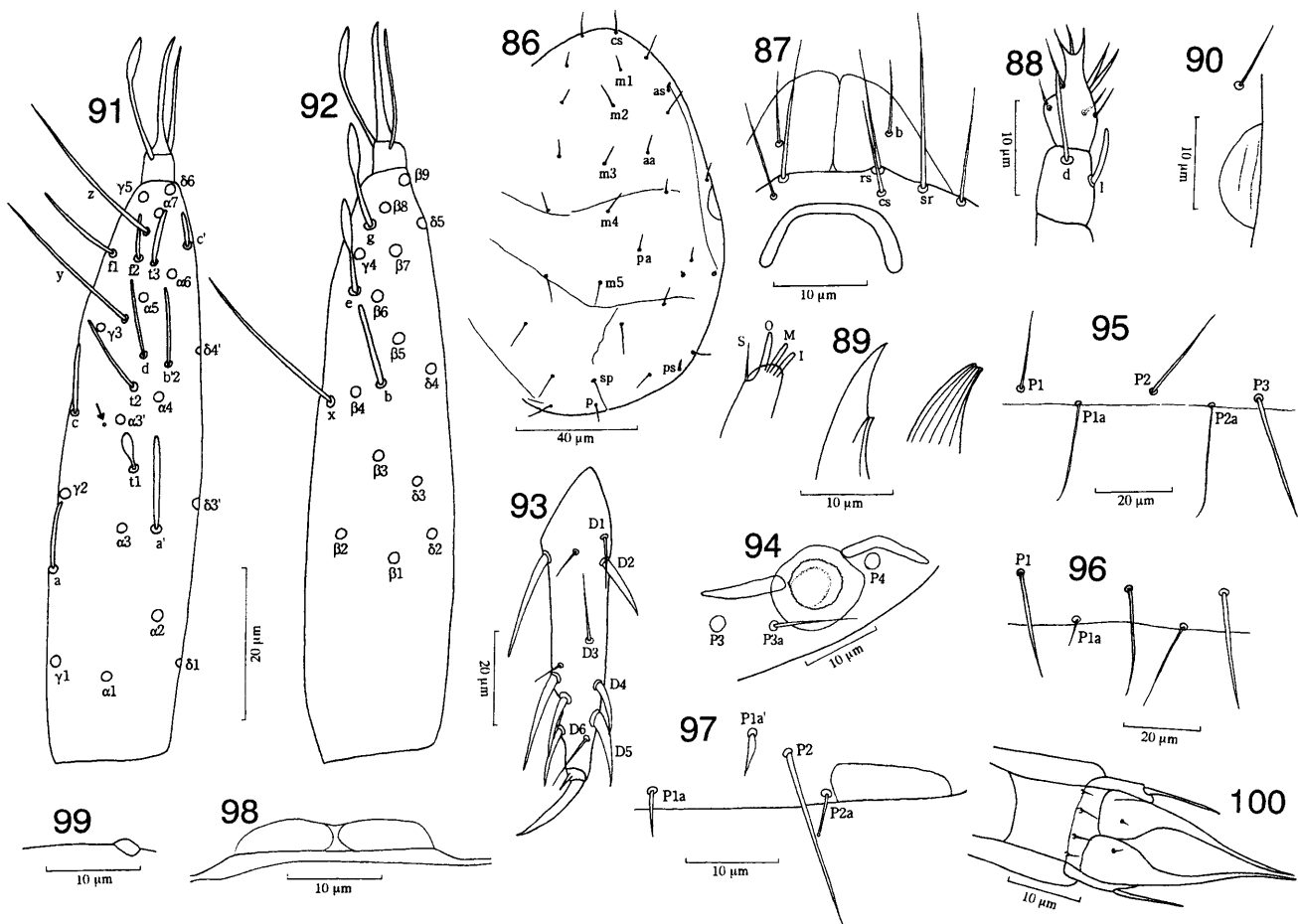
Body: Tracheal camerae similar to that of preceding species (Fig. 94).

Chaetotaxy as in Table 6 and Figs. 95–97. On abdominal tergites II–VI, accessory setae, P1a and P2a,

delicate and longer than P1 (Figs. 95); P1a on VII short, about 1/3 of P1 and situated at hind margin (Fig. 96); P2 and P1a' on VIII not displaced, P1a' aristate and P2a capitulate (Fig. 97).

Central lobe of praecosta trapezoidal, not incised (Fig. 98). Laterostigmata II–IV (Fig. 99) and openings of dermal glands of abdominal tergites IX and X as in preceding species. Abdominal tergite XI with a pore between both 1. Sternite VIII with a pore anterior to Pc; IX and X each with a pore between both 1. Telson with two dorsal central pores. Penis with short basiperiphallar setae. Female unknown.

Larva II. Body length 572 μm ; head 120 $\mu\text{m} \times 94 \mu\text{m}$; pseudoculus observed insufficiently. Foretarsus 80 μm , $\text{TR} = 4.7$, $\text{EU} = 1.02$, $\text{BS} = 1.05$; middle tarsus 41 μm , claw 13 μm ; hind tarsus 50 μm , claw 15 μm .



Figs. 86–100. *Eosentomon* sp. Kh 86, head, dorsal view. 87, anterior margin of head, dorsal view. 88, maxillary palpus. 89, galea (left), lacinia (center) and mandible (right). 90, pseudoculus. 91, foretarsus, interior view. 92, foretarsus, exterior view. 93, hind tarsus. 94, trachea of thoracic tergite III. 95, posterior setae on abdominal tergite III. 96, posterior setae on abdominal tergite VII. 97, posterior margin of abdominal tergite VIII. 98, praecosta on abdominal tergite VI. 99, laterostigma III. 100, penis. Arrow shows a pore.

Table 6. Chaetotaxy of *Eosentomon* sp. Kh

		Larva II		Imago	
		Formula	Compositon of setae	Formula	Tertiary and Complementary setae
(Dorsal)					
Thorax	I	–		4	1, 2
	II–III	6	A2, 4, M	6	
Abdomen		14	P1, 1a, 2, 2a, 3, 4, 5	20	P3a, 5a, 5a'
	I	0		4	A1, 2
		10	P1, 1a, 2, 3, 3a	12	P3a'
	II	0		10	A1, 2, 3, 4, 5
		–	P1, 1a, 2, 2a, 3, 4, –	16	P4a, 5
	III–IV	4	A4, 5	10	A1, 2, 3
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	16	
	V–VI	4	A4, 5	8	A1, 2
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	16	
	VII	4	A4, 5	4	
		16	P1, 1a, 2, 2a, 3, 4, 4a, 5	16	
	VIII	6	M2, 4, 5	6	
		9	Pc, 1a, 1a', 2, 2a	9	
	IX	8	1, 2, 3, 4	8	
X–XI				8	1, 2, 3, 4
Telson		9	c, 1, 2, 3	9	
(Ventral)					
Thorax	I	6–2	A1,2, 3, M	6–2	
		6	P1, 2, 3	6	
	II–III	6–2	A1, 2, 3, M1	6–4	M2
		6	P1, 2, 3	8	P2a
Abdomen	I	4	A1, 2	4	
		4	P1, 2	4	
	II–III	4	A1, 2	6	A3
		4	P1, 2	4	
	IV–VII	4	A1, 2	6	A3
		8	P1, 2, 2a, 3	10	P2a'
	VIII	0		2	A
		7	Pc, 1, 1a, 2	7	
	IX	4	1, 2	6	1a
	X			6	1, 1a, 2
	XI			8	1, 2, 3, 4
Telson		12		12	

Remarks. This species is presumably an undescribed form similar to *E. asahi* Imadaté from Japan and China and *E. yinae* Szeptycki & Imadaté, 1987 from North Korea. For most species of *Eosentomon*, it is difficult to identify males and juveniles. Since only two males and one LII are in hand, it is preferable to leave this form undetermined until female specimens will be obtained.

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摘 要

中村修美（埼玉県立自然史博物館 〒369-1305 埼玉県秩父郡長瀬町長瀬 1417-1）：極東ロシア、ハバロフスクのカマアシムシ類。

Edaphologia No. 75: 17–35, 2004.

2000 年に実施された日ロ共同調査「ロシア北方林の生物多様性の解析および共生系に与える森林攪乱の影響評価に関する研究」により、ハバロフスクから 57 個体のカマアシムシ類が採集された。精査の結果、6 属 9 種が認められたが、うち 4 種を新種として記載した。また、種名未確定の 1 種を除いた既知種の 4 種は、いずれもロシア初記録であった。

References

- Bernard, E. C., 1990. New species, clarifications, and changes in status within *Eosentomon* Berlese (Hexapoda: Protura: Eosentomidae) from the United States. *Proceedings of the Biological Society of Washington*, **103**: 861–890.
- Imadaté, G., 1956. A new species and a new subspecies of Protura from Shikoku. *Transactions of the Shikoku Entomological Society*, **4**: 103–106.
- Imadaté, G., 1960. Notes on Protura from Hiba, Japan, with the description of a new species. *Miscellaneous Report of the Hiwa Museum for Natural History*, **3**: 1–3. (in Japanese with English summary)
- Imadaté, G., 1961. A new species of Protura, *Eosentomon asahi* n. sp., from Japan. *Kontyû, Tokyo*, **29**: 123–131.
- Imadaté, G., 1964. Taxonomic Arrangement of Japanese Protura (I). *Bulletin of the National Science Museum, Tokyo*, **7**: 7–81.
- Imadaté, G., 1974. *Protura, Fauna Japonica*. Keigaku Publishing Co., Tokyo.
- Imadaté, G., 1981. Occurrence of *Nosekiella* (Protura, Acerentomidae) in Japan. *Annotationes Zoologicae Japonenses*, **54**: 142–146.
- Martynova, E. F., 1977. *Acerella sharovi* sp. n. (Protura, Acerentomidae) from the Magadan District. *Zoologicheskij Zhurnal*, **56**: 164–167. (In Russian with English summary)
- Nakamura, O., 1995. A new species and a new record of the genus *Baculentulus* (Protura, Acerentomidae) from Japan. *Japanese Journal of Entomology*, **63**: 333–345.
- Nakamura, O., 2001. A new species of the genus *Filientomon* from central Japan (Protura: Acerentomidae). *Edaphologia*, **68**: 33–37.
- Rusek, J., 1974. Zur Taxonomie einiger Gattungen der Familie Acerentomidae (Insecta, Protura). *Acta Entomologica Bohemoslovaca*, **71**: 260–281.
- Silvestri, T., 1907. Descrizioni di un nuovo genere d'insetti apterigoti, rappresentante di un novo ordine. *Bollettino del Laboratorio di Zoologia generale e agraria della R. Scuola d'Agricoltura in Portici*, **1**: 296–309.
- Szeptycki, A., 1980. Polish Protura. I. Genus *Acerentomon* Silvestri, 1907. *Polskie Pismo Entomologiczne*, **50**: 311–392.
- Szeptycki, A., 1984. Three new species of *Eosentomon* Berlese, 1909, from Poland with redescription of *Eosentomon germanicum* Prell, 1912 (Protura). *Polskie Pismo Entomologiczne*, **54**: 195–213.
- Szeptycki, A., 1988. New genera and species of Protura from the Altai Mts. *Acta Zoologica Cracoviensia*, **31**: 297–362.
- Szeptycki, A., 2002. The taxonomy of Protura — present status and future problems. *Pedobiologia*, **46**: 209–214.
- Szeptycki, A. and Imadaté, G., 1987. The Proturans from North Korea (II). *Bulletin of the National Science Museum, Tokyo, Series A (Zoology)*, **13**: 165–183.
- Tuxen, S. L., 1964. *The Protura. A revision of the species of the world with keys for determination*. Hermann, Paris.
- Yin, W.-Y., 1980. Studies on Chinese Protura: Description of new specie and new genera of the family Acerentomidae with discussions of their phylogenetic significance. *Contributions from Shanghai Institute of Entomology*, **1**: 135–156. (in Chinese with English summary)
- Yin, W.-Y., 1999. *Protura, Fauna Sinica, Arthropoda*. Science Press, Beijing. (in Chinese with English summary)
- Yin, W.-Y. and Xie, R.-D., 1993. A new genus, two new species and two new records of Protura from the Northeast China. *Contributions from Shanghai Institute of Entomology*, **11**: 63–71. (in Chinese with English summary)

Appendix: Abbreviations used in text and figures

Head

<i>a</i> :	additional seta.
<i>aa</i> :	anterior additional seta.
<i>ap</i> :	seta situated anteriorly to pseudoculus.
<i>as</i> :	anterior sensillum.
<i>b</i> :	labral seta.
<i>cs</i> :	clypeal seta.
<i>d</i> :	dorsal sensillum on penultimate segment of maxillary palpus.
EU:	ratio of length of the empodium/length of the claw.
<i>f</i> :	fringes on praelabium.
<i>I</i> :	inner digit of galea.
<i>l</i> :	lateral sensillum on penultimate segment of maxillary palpus.
<i>ls</i> :	lateral seta.
<i>M</i> :	median digit of galea.
<i>m1–m5</i> :	median setae arranged in a row, m1 located most anteriorly and m5 most posteriorly.
<i>O</i> :	outer digit of galea.
<i>p</i> :	posterior seta.
<i>pa</i> :	posterior additional seta.
<i>pp</i> :	postpseudocular seta.
PR:	ratio of length of the head behind the rostral setae/length of the pseudoculus.
<i>ps</i> :	posterior sensillum.
<i>rs</i> :	rostral seta.
<i>s</i> :	sensillum on labial palpus.
<i>S</i> :	exterior spine of galea.
<i>sp</i> :	subposterior seta.
<i>sr</i> :	subrostral seta.
<i>t</i> :	tubercles on praelabium.
TR:	ratio of foretarsal length/length of the claw.

v:	ventral sensillum on penultimate segment of maxillary palpus.	$\delta 1$ – $\delta 6$:	exterior setae arranged in a row, $\delta 1$ located most proximally and $\delta 6$ most distally.
Foretarsus		Hindtarsus	
a – g :	exterior sensilla arranged in a row, a located most proximally and g most distally.	D1–D5:	dorsal setae arranged in a row, D1 located most proximally and D5 most distally.
a' – c' :	interior sensilla arranged in a row, a' located most proximally and c' most distally.	Body	
BS:	ratio of distance between the proximal end and sensillum $t1$ /distance between $t1$ and distal end.	A:	anterior setae on sternite VIII and telson
$t1$ – $t3$:	dorsal sensilla arranged in a row, $t1$ located most proximally and $t3$ most distally.	A1–A5:	anterior setae numbered from the median line outward.
x:	exterior seta between $\gamma 2$ and $\gamma 3$ in Eosentomidae.	Ac:	central anterior seta.
y:	dorsal seta posterior to $\alpha 5$ in Eosentomidae.	M:	middle setae on thoraces.
z:	dorsal seta posterior to $\alpha 7$ in Eosentomidae.	M1–M5:	middle setae on thoraces and abdominal tergites VIII numbered from the median line outward.
$\alpha 1$ – $\alpha 7$:	dorsal setae arranged in a row, $\alpha 1$ located most proximally and $\alpha 7$ most distally.	P1–P5:	posterior principal setae numbered from the median line outward.
$\beta 1$ – $\beta 9$:	ventral setae arranged in a row, $\beta 1$ located most proximally and $\beta 9$ most distally.	P1a–P5a':	posterior accessory setae numbered from the median line outward.
$\gamma 1$ – $\gamma 5$:	interior setae arranged in a row, $\gamma 1$ located most proximally and $\gamma 5$ most distally.	Pc:	central posterior seta.
		R:	rotary wheel.